~~44-06~~

44-01

LAW ENVIRONMENTAL

PROJECT MANUAL

DIKE VERTICAL EXTENSION

LANDFILL 6B, C

CHAMPION INTERNATIONAL

Canton, North Carolina

-Prepared For-
Champion International Company
Law Environmental Job No. 56-1621
January 13, 1992

Canton Mill
Box C-10
Canton, North Carolina 28716

Champion
Champion International Corporation

May 12, 1992

Mr. James Coffey
North Carolina Department
of Environment, Health and Natural Resources
Solid Waste Section
PO Box 27687
Raleigh, NC 27611-7687

RE: Canton Landfill NO. 6, Areas B and C

Dear Mr. Coffey:

Attached are two (2) copies of the "Project Manual for the Dike Vertical Extension, Landfill 6 B, C", as submitted by Law Environmental, Inc., regarding Champion International Corporation Landfill No. 6, Areas A and B, under Permit No. 44-06. Champion requests permission to proceed with the vertical dike extension project.

The design features described herein are in accordance with "Design Requirements for Vertical Expansion of Existing Sanitary Landfills", taken from the Solid Waste Management Rules 10 NCAC 10G, Section .0504. In addition to the information provided in the above report, please note that the anticipated life of the project is six (6) to eight (8) months from time of completion. Dike construction fill material will originate from cell #6D, or material that was excavated for the lime and asbestos cell construction. Erosion control in the 6D borrow area presently includes a siltation basin, and a silt fence will be constructed below the borrow area and the area will be seeded when construction is complete. An erosion control silt fence will be constructed below the vertical slope of the new dike construction area, and the dike extension will be seeded when construction is complete. Champion will have an approved soil and erosion control plan prior to any construction activities.

Please let me know should additional information be required.

Sincerely,

Jim Giauque

JG/spm

Attachment

IVED SEP 1 6 1992

State of North Carolina
Department of Environment, Health, and Natural Resources
Asheville Regional Office

James G. Martin, Governor
William W. Cobey, Jr., Secretary

LETTER OF APPROVAL

Ann B. Orr
Regional Manager

September 14, 1992

Mr. J. Ross Kilpatrick
Champion International Corp.
P. O. Box C-10
Canton. NC 28716

Dear Mr. Kilpatrick:

This office has reviewed the erosion and sedimentation control plan submitted for the project listed below. We find the plan to be acceptable and hereby issue this Letter of Approval. Please be advised that Title 15A, North Carolina Administrative Code 4B.0017(a), requires that a copy of the approved soil erosion control plan be on file at the job site. Also, you should consider this letter to give the Notice required by NCGS §113A-61(d) of our right of periodic inspection to ensure compliance with the approved plan.

The State's Sedimentation Pollution Control Program is a performance-oriented program requiring protection of the natural resources and adjoining properties. If, following commencement of this project, it is determined that the plan is inadequate to meet the requirements of NCGS §113A-51 to 66, this office may require revisions to the plan and implementation of the revisions to ensure compliance with the Act.

Please note that this approval is based in part on the accuracy of the information provided in the Financial Responsibility Form which you have provided. You are requested to file an amended form if there is any change in the information included on the form. In addition, it would be helpful if you notify this office of the proposed starting date for this project. Your cooperation is appreciated.

Sincerely,

Dennis G. Owenby
Asst. Regional Engineer

DGO/a
cc: Mr. James A. Giauqe
Project name: Landfill #6 B & C Vertical Expansion
Location: Haywood County
Date received: 9/08/92
Date approved: 9/14/92 New submittal (✓) Revision ( )

State of North Carolina
Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
P.O. Box 27687 · Raleigh, North Carolina 27611-7687

James G. Martin, Governor
William W. Cobey, Jr., Secretary

William L. Meyer
Director

October 16, 1992

Mr. Jim Giauque
Champion International Corporation
Canton Mill
Box C-10
Canton, North Carolina 28716

RE: Amendment to Permit No. 44-06
Vertical Expansion - Areas B and C
Haywood County

Dear Mr. Giauque:

Enclosed is an Amendment to Solid Waste Permit and Conditions of Permit for vertical expansion of Landfill No. 6, Areas B and C. This expansion should provide sufficient time for completion of construction of the lined landfill unit in Area A.

The Section is concerned that you move into the lined area as soon as possible, since groundwater monitoring data indicates possible contamination. The Section Hydrologist will be in contact with you to discuss assessment procedures.

If you need additional information, please contact me at (919) 733-0692.

Sincerely,

Sherri C. Hoyt

Sherri C. Hoyt
Environmental Engineer
Solid Waste Section

cc: Julian Foscue
Jim Patterson

AMENDMENT TO PERMIT NO. 44-06
DATE ISSUED 10/16/92

STATE OF NORTH CAROLINA

DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES

DIVISION OF SOLID WASTE MANAGEMENT

P.O. BOX 27687 RALEIGH, NC 27611

S O L I D W A S T E P E R M I T

Champion International Corporation
Canton Mill

is hereby issued a permit to operate a

SANITARY LANDFILL

located

NCSR 1550 and I-40, Haywood County

in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit.

James C. Coffey, Supervisor
Permitting Branch
Solid Waste Section

AMENDMENT TO PERMIT NO. 44-06
DATE ISSUED 10/16/92

A M E N D M E N T TO

S O L I D W A S T E P E R M I T

SANITARY LANDFILL

CONDITIONS OF PERMIT:

GENERAL

1. The approved plan is described by the documents listed in Attachment 1, "List of Documents for Approved Plan".

2. When this property is sold, leased, conveyed or transferred, the deed or other instrument of transfer shall contain in the description, in no smaller type than that used in the body of the deed or instrument, a statement that the property has been used as a sanitary landfill.

3. This solid waste disposal site is permitted to receive solid waste as described in the approved plan, and as defined in 15A NCAC 13B .0101(36), excluding hazardous wastes and liquid wastes. Only solid waste generated by Champion International Corporation, Canton, Mill, may be disposed at this facility. Acceptance of wastes not specifically mentioned in the approved plan shall be in accordance with 15A NCAC 13B .0103(d).

CONSTRUCTION AND OPERATION

1. This permit is for vertical expansion of Landfill No. 6, Areas B and C, in accordance with the approved plan and as specified herein:
   a. Vertical expansion is limited to a period of no more than one year.
   b. Additional conditions and revisions of the approved plan shall be approved by the North Carolina Solid Waste Management Division.

2. All sedimentation/erosion control activities will be conducted in accordance with the Sedimentation Pollution Control Act codified at 15 NCAC 4.

3. This facility shall conform to operating procedures in Rule .0505 of the Solid Waste Management Rules, and the conditions specified herein.

4. A closure and post-closure plan must be submitted for approval at least 90 days prior to closure of any landfill unit. The plan must include all steps and measures necessary to close and maintain the facility in accordance with all rules in effect at that time. The proposed final cover will be evaluated based

CONSTRUCTION AND OPERATION (cont.)

upon performance and upgraded if necessary. At a minimum, this plan shall include existing contours, remaining capacity, actual limits of the waste boundary for each unit, estimated date of closure, maintenance and monitoring requirements, and final cover specifications.

MONITORING AND REPORTING REQUIREMENTS

1. Champion International Corporation shall adhere to the routine sampling and analysis plan for ground and surface waters previously approved in the Amendment to Permit, dated 1/9/92, which approves the addition of a lined expansion at Area A, Cells III and IV.

2. The permittee shall submit analytical data for sampling events to the Division of Solid Waste Management, Solid Waste Section Hydrogeologist, in a timely manner. Data for all sampling events shall be maintained on site as well.

3. Ground water quality at this facility is subject to the classification and remedial actions provisions referenced in Rule .0503 (2) (d) of 15A NCAC 13B.

4. A record indicating the amount, in tons, of solid waste disposed at the facility, compiled on a monthly basis, shall be maintained, To the maximum extent practicable, this record shall categorize the waste by type. The requirement to record the amount of solid waste disposed does not apply to wastewater treatment plant sludge.

5. On or before August 1, 1993, and each year thereafter, the permittee shall report the amount of waste (in tons) received at this facility and disposed of in the landfill to the Solid Waste Section, on forms prescribed by the Section. This report shall include the following information:

   a. The reporting period shall be for the previous year, beginning July 1, and ending June 30;
   b. The amount of waste received and landfilled in tons compiled on a monthly basis, according to Condition 4 described above; and
   c. Notification that a copy of the report has been forwarded to the County Manager of all counties from which waste was received.

ATTACHMENT 1:

List of Documents for Approved Plan

1. Project Manual, Dike Vertical Extension, Landfill No. 6, Areas B and C, submitted May 12, 1992.

2. Response to July 27, 1992, Completeness Review, submitted September 3, 1992.

3. Letter of Approval for Erosion and Sedimentation Control Plan, dated September 14, 1992.

APPROVED
SOLID & HAZARDOUS WASTE MGMT. BRANCH
DATE APPROVED 10/16/92

LAW ENVIRONMENTAL, INC.

4333 WILMONT ROAD, SUITE 300
CHARLOTTE, NORTH CAROLINA 28217
P.O. BOX 240674
CHARLOTTE, NORTH CAROLINA 28224-0674
704-357-1747 704-357-1622 (FAX)

January 13, 1992

Champion International Corporation
P. O. Box C-10
Canton, North Carolina 28716

Attention: Mr. George Pickard

Subject: Project Manual
Dike Vertical Extension
Landfill 6 B, C
Champion International
Canton, North Carolina
Law Environmental Job No. 56-1621

Dear Mr. Pickard:

As authorized by your acceptance of our Proposal No. 56-1245 dated October 14, 1991, Law Environmental has completed engineering design services for the subject project. These services included preparation of design drawings and specifications for vertically raising the main dike at Landfill 6 B, C. Also included was performance of a geotechnical exploration and slope stability analyses to verify the technical feasibility of raising the existing dike in order to increase the landfill capacity and service life.

This Project Manual includes the following:

Attachment	A	-	Geotechnical Report and Slope Stability Analyses
Attachment	B	-	Design Drawings for Landfill Dike Vertical Extension
Attachment	C	-	Technical Specifications for Construction

The geotechnical report in Attachment A provides a brief description of the project, describes the field and laboratory work performed and presents the results obtained along with the slope stability analyses and evaluation.

Champion International Corporation
Law Environmental No. 56-1621
January 13, 1992

The design drawings and technical specifications are presented in Attachments B and C, respectively.

Thank you for the opportunity to provide our professional services during this phase of your project. Please contact us when we can be of further service or if you have any questions concerning this Project Manual.

Sincerely,

LAW ENVIRONMENTAL

Thomas F. Beggs, P.E.
Principal Engineer
Registered, N.C. 13807

Fred C. Tucker, P.E.
Chief Engineer
Registered, N.C. 8160

TFB:FCT:am

Attachments

ATTACHMENT A

GEOTECHNICAL EXPLORATION AND

SLOPE STABILITY ANALYSES

December 11, 1991

LAW ENGINEERING

A MEMBER OF LAW COMPANIES GROUP

Law Environmental, Inc.
4333 Wilmount Road, Suite 300
Charlotte, North Carolina 28208

Attention: Mr. Fred C. Tucker, P.E.

Subject: Report of Geotechnical Exploration
Dike Vertical Extension
Landfill 6 B,C
Champion International
Canton, North Carolina
Law Job No. 242-04344-01

Dear Mr. Tucker:

As authorized by your project Work Order dated November 12, 1991, Law Engineering has completed a geotechnical exploration for the subject project. The purpose of this exploration was to develop information about the site and subsurface conditions and to evaluate the stability of the proposed vertical extension of the existing landfill dike. The attached report describes the work performed and presents the results obtained, along with our geotechnical evaluation.

Thank you for the opportunity to provide our professional geotechnical services during this phase of your project. Please contact us when we can be of further service or if you have any questions concerning this report.

Very truly yours,

LAW ENGINEERING

Mohsen Sefat

Mohsen Sefat, E.I.T.
Project Geotechnical Engineer

Gary L. Weekley

Gary L. Weekley, P.E.
Principal Geotechnical Engineer
Registered, N.C. 8251

MS:GLW:am
Attachment

P.O. BOX 11297
CHARLOTTE, NC 28220
4333 WILMONT ROAD, SUITE 100
CHARLOTTE, NC 28217
704-357-8600
FACSIMILE 704-357-8639

PROJECT INFORMATION

Champion International wants to increase the capacity of existing Landfill 6 at their Canton, North Carolina paper mill facility. Landfill 6 was originally constructed in 1981 and raised, in part, in 1986. This part of the landfill is divided into two areas (B and C) by a cross dike. Area B has been completely filled and the waste covered with a soil layer. Area C is actively being filled with waste material (fly ash, cinders, lime and predominantly sludge). The main dike varies in height from approximately 35 to 90 feet. The existing crest is approximately 30 feet wide. The crest of the portion of the main dike parallel to the Pigeon River presently slopes upward from east to west with elevations varying from approximately 2642 to 2687 feet. The crest of the end dikes and cross dike slopes upward to the north away from the main dike. The outside slope of the main dike at Area B is 2H:1V and at Area C is 2.25 H:1V.

The main dike will be raised approximately 25 feet with new crest elevations (at subgrade) of 2665 feet in Area B and 2685 feet in Area C with an approximately 6 percent connecting slope. Champion originally desired a uniform top elevation equal to the elevation at the west end of the Area C main dike, or a maximum vertical dike extension of as much as 45 feet. The results of stability analyses presented subsequently in this report indicate a limiting height of 25 feet for the vertical extension. The outside slope of the vertical extension will be 2H:1V which will match the slope in Area B but will require steepening the slope in Area C. The crest of the proposed extension will be 12 feet wide.

Our understanding of the above project information is based on discussions with Mr. George Pickard of Champion International, our project files and the work we have performed on this project.

FIELD EXPLORATION

Soil Test Borings

Five soil test borings were made at the site at locations shown on the attached Boring Location Plan (Figure 1). The boring locations were selected by Law Environmental, and were located in the field by our engineer from map-scaled distances, using a tape and estimated right angles.

The borings were made by mechanically twisting a continuous flight steel auger into the soil. Soil sampling and penetration testing were performed in general accordance with ASTM D 1586. At regular intervals, soil samples were obtained with a standard 1.4-inch I. D., 2-inch O. D., split-tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, and then driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final 12 inches was recorded and is designated the "penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil's strength and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the laboratory. In the laboratory, the samples were examined by a geotechnical engineer to verify the driller's field classifications. Test Boring Records are attached, showing the soil descriptions and penetration resistances.

Undisturbed Sampling

Split-barrel samples are suitable for visual examination and classification tests but are not sufficiently intact for quantitative laboratory tests. Therefore, relatively undisturbed samples were obtained of waste fill (fly ash) and embankment soil in selected borings by drilling to the desired depth and hydraulically forcing a section of 3-inch O.D., 16 gauge steel tubing into the soil. The sampling procedure is described by ASTM D 1587. Each tube, together with the encased soil, was carefully removed from the ground, made airtight and transported to the laboratory. The depths of undisturbed samples are shown on the appropriate Test Boring Records. (One sample was obtained in an offset boring, AB-1, next to boring B-1, after several unsuccessful attempts were made to obtain a satisfactory sample of the fly ash in boring B-2).

LABORATORY TESTING

Triaxial Shear

Several sections of the undisturbed samples of fly ash and embankment soil were extruded from their sampling tubes for triaxial shear testing. The sections were encased in rubber membranes, then placed in a compression chamber and confined by all-around water pressure (the minor principal stress).

The sections were then saturated under back pressure prior to shearing to simulate the worst moisture condition that may exist in the waste material or embankment dam. Drainage was allowed from the sample to equilibrium under the confining stress, but no drainage was allowed during the load to failure. The test is termed consolidated-undrained, and total stresses (R) result if no pore pressure corrections are included. The pore water pressures developed during loading to failure were measured, subtracted from the total stresses, and the stresses then expressed as effective stresses (R). The test thus presented is termed consolidated-undrained with pore pressure correction and is equivalent to a drained test (S). Results for both total stress and effective stress strengths are presented on the attached Triaxial Compression Test sheets.

SUBSURFACE CONDITIONS

Borings B-1 and B-2 were located in Area B. Both B-1 and B-2 encountered soil fill to depths of 8.5 and 13.5 feet, respectively, underlain by waste fill consisting of ash and cinders with some sludge. The soil fill consisted of loose to firm silty sand. The waste fill was encountered to a depth of 44 feet at B-1 and the boring termination depth of 65 feet at B-2. The penetration resistance of the waste fill ranged from weight of hammer to 17 blows per foot but was typically 1 to 5 blows per foot. Beneath the ash, boring B-1 encountered soil fill.

Borings B-3, B-4 and B-5 were located in Area C. These borings encountered waste fill consisting of ash and cinders or lime to approximate depths of 25 feet at B-3, 4.5 feet at B-4 and 14 feet at B-5. Beneath the waste fill, the borings encountered soil fill consisting of loose to firm silty sand. The penetration resistance of the waste fill varied from weight of hammer to 5 blows per foot.

Ground water (leachate) levels were encountered at a depth of 10 ft at time of boring at B-1 and at 9 ft after 24 hours at B-2. Borings B-3 and B-4 were caved at depths of 8 ft and 11 ft, respectively, suggesting the presence of ground water just below these depths. Ground water was not encountered at boring B-5.

The above descriptions provide a general summary of the subsurface conditions encountered. The attached Test Boring Records contain detailed information recorded at each boring location. These Test Boring Records represent our interpretation of the field logs based on engineering examination of the field samples. The lines designating the interfaces between various strata represent approximate boundaries and the transition between strata may be gradual.

SLOPE STABILITY ANALYSES AND EVALUATION

The critical section of the vertical extension to the main dike, judged to be at the maximum height section of the Area B dike, was analyzed with respect to static slope stability. The final section analyzed is shown on Figures 2, 3, and 4 along with the interpreted design soil parameters used in the analyses. The design strength parameters for the embankment soils and

ash are based on triaxial shear testing of undisturbed samples. Strength parameters used for the sludge and residual soils in the analyzed section were estimated based on previous testing of reasonably similar material type and allowing for a prudent degree of conservatism.

The slope stability analyses were performed for two static loading conditions: (1) end of construction (inside and outside slopes) and (2) long term (outside slope).

The "design" phreatic line used in the stability analyses is similar to the phreatic line used in the original analysis modified to include waste in the new areas.

Circular arc failure surfaces were assumed and used in the stability analyses. The factor of safety in the circular arc rotational analysis is defined as the ratio of the resisting moments to the driving moments tending to produce failure. A computer program, based on the modified Bishop method of analysis, was used to allow many different assumed circular arc failure surfaces to be checked. The minimum safety factors generally recommended are 1.25 for end of construction conditions and 1.5 for long term operating conditions.

Results of the analyses performed for the dam are illustrated on Figures 2, 3 and 4. The resulting factors of safety under the assumed static operating conditions of the dam are generally above the recommended minimum factors of safety except for some marginal values, 1.21 for end of construction and 1.48 for long term conditions on the downstream slope. In our opinion, the marginally lower safety factors are acceptable.

QUALIFICATION OF REPORT

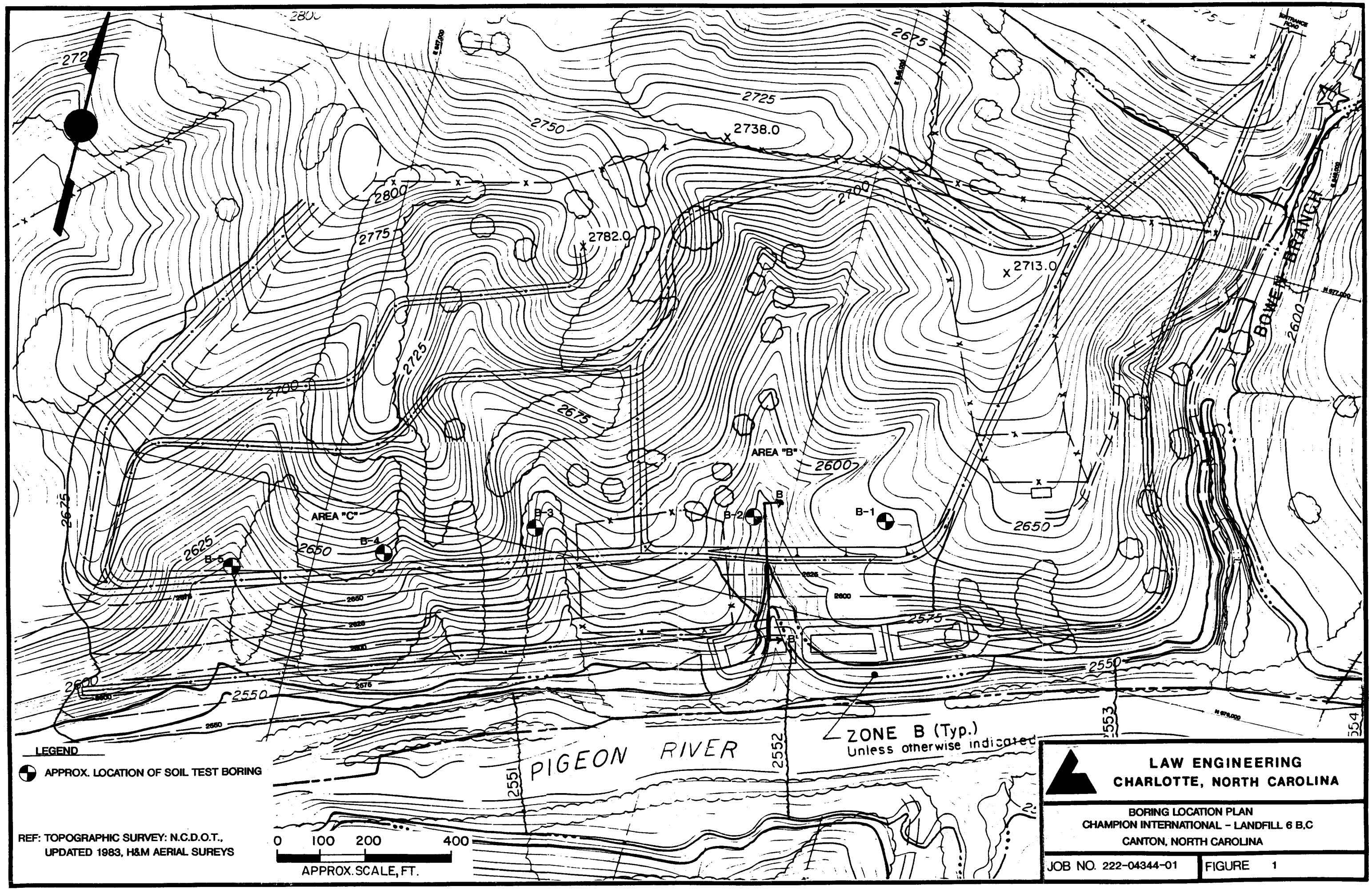
The exploratory activities, testing procedures, and evaluative approaches used in this exploration have been consistent with those normally employed in geotechnical engineering for earth dikes of this type. In a very real sense, however, the information obtained is fragmentary. The dispersed borings, test pits and assigned tests represent an extremely small sampling from the reference soil volume about which information is needed. Although fragmentary, useful design guidelines can be developed from this data.

Major subsurface discontinuities or soil quality changes that can affect the performance of a dike often occur within very short lateral distances. It is unlikely that the dispersed sampling used in subsurface explorations will identify all variant conditions; also, there could be a bias in the representation of prevailing or average conditions. In addition, the constructed product may not fully achieve the intent of the plans and specifications. Appropriate field observations by engineers and technicians during construction will provide the best format for identification of variant conditions and for initiating proper remedial action.

Unfortunately, there are occasional problems in dikes where construction is performed in conformance with contract requirements and with the work conducted under general engineering review. There is, therefore, an element of risk which the owner must accept in electing to construct such a structure.

Qualified engineering during design and construction together with post-construction performance checks constitutes the owner's best resources for minimizing problems or identifying problems at an early stage before they become critical. Any type of problem correction is likely to have associated costs or time delays. We recommend, therefore, that the owner's budget and planning consider this possibilty.

The design recommendations presented in this report have been based in-part on the preliminary design information provided to us. As the final design proceeds, some of the plans may change. As design changes are made or as designs are finalized, we request that we review these changes with respect to our recommendations. We look forward to being of assistance to you in future phases of this project.



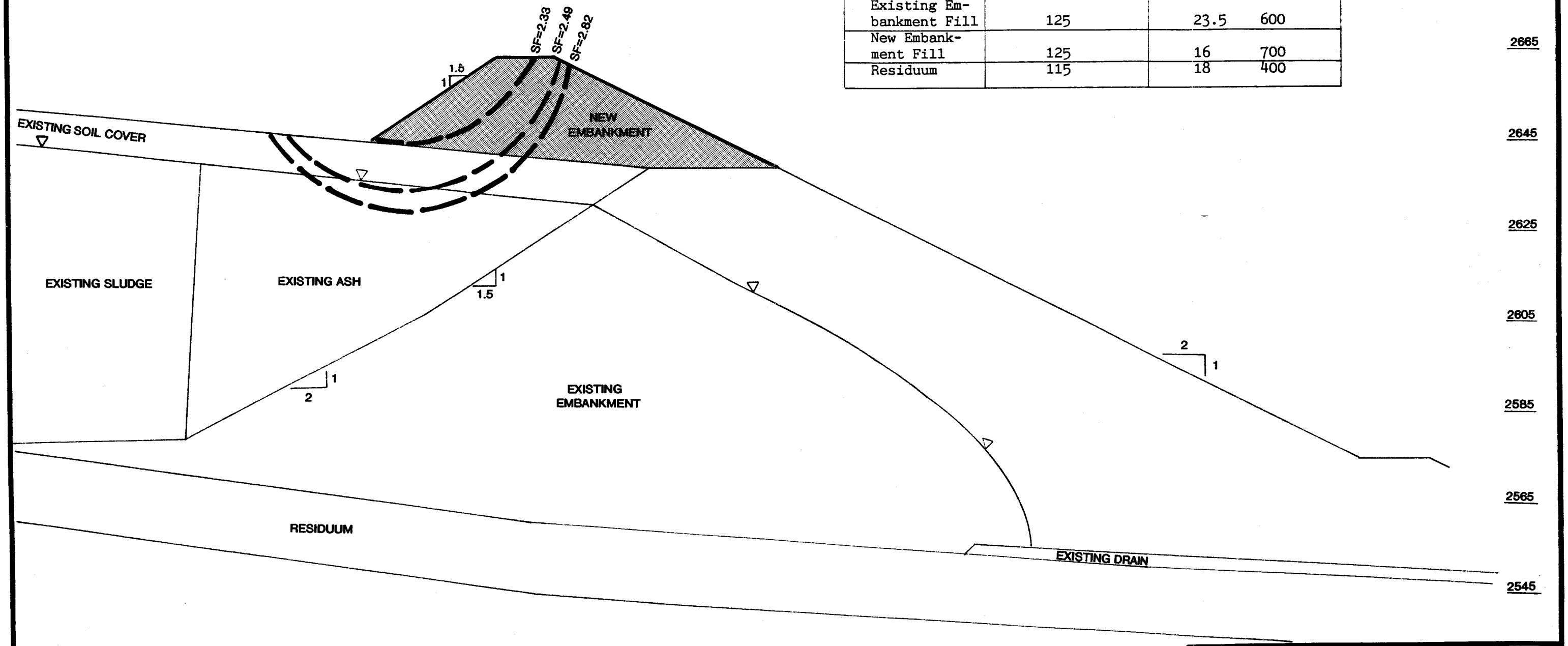
LAW ENGINEERING
CHARLOTTE, NORTH CAROLINA

BORING LOCATION PLAN
CHAMPION INTERNATIONAL - LANDFILL 6 B.C
CANTON, NORTH CAROLINA

JOB NO. 222-04344-01 | FIGURE 1

DESIGN STRENGTH PARAMETERS

Material	Unit Weight, pcf	End of Construction ϕ°	C,psf
Ash	100	30	0
Sludge	55	10	100
Soil Cover	110	29	0
Existing Embankment Fill	125	23.5	600
New Embankment Fill	125	16	700
Residuum	115	18	400



SECTION B-B'
END OF CONSTRUCTION CONDITIONS
INSIDE SLOPE

0 20 40
APPROX.SCALE,FT.

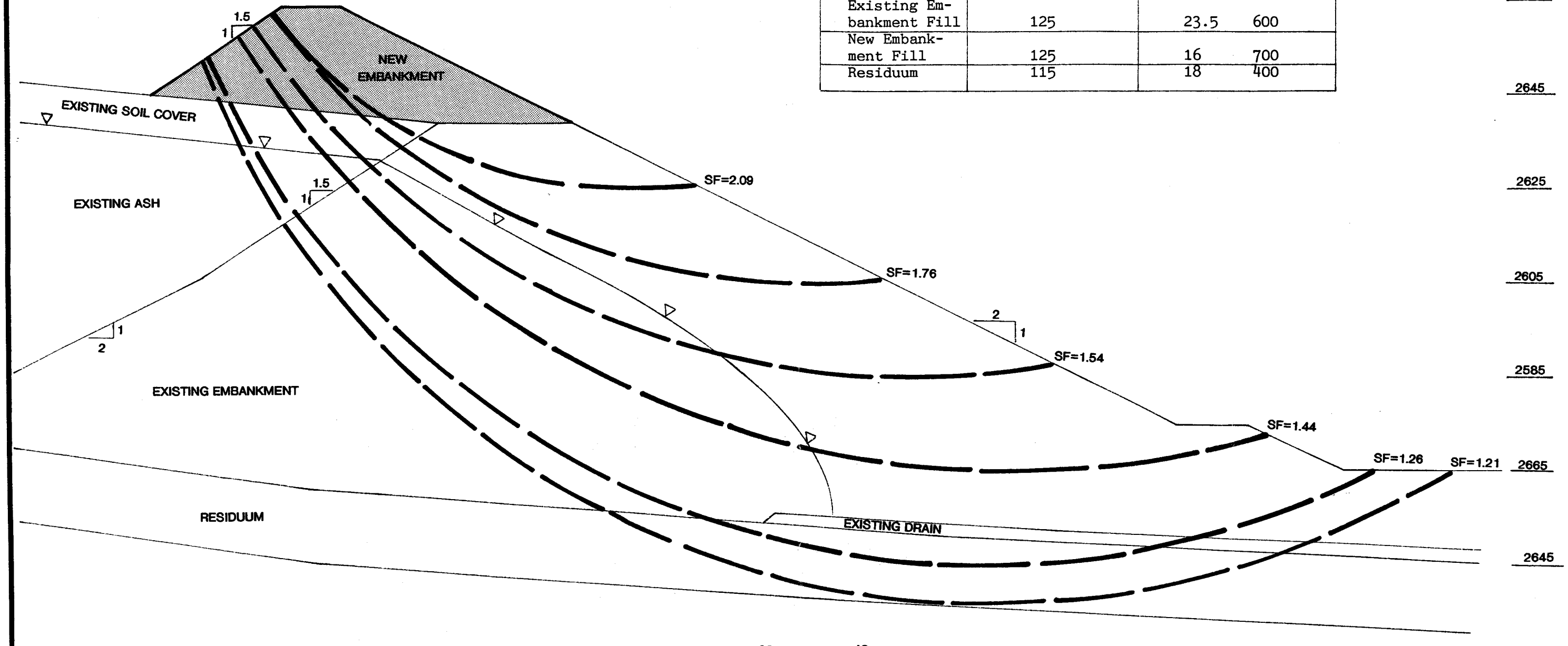
LAW ENGINEERING
CHARLOTTE, NORTH CAROLINA

SLOPE STABILITY ANALYSES
LANDFILL DIKE VERTICAL EXTENSION
CHAMPION INTERNATIONAL - LANDFILL 6 B,C
CANTON, NORTH CAROLINA

JOB NO. 222-04344-01 | FIGURE 2

DESIGN STRENGTH PARAMETERS

Material	Unit Weight, pcf	End of Construction	
		ϕ°	C,psf
Ash	100	30	0
Sludge	55	10	100
Soil Cover	110	29	0
Existing Embankment Fill	125	23.5	600
New Embankment Fill	125	16	700
Residuum	115	18	400



SECTION B-B'
END OF CONSTRUCTION CONDITIONS
OUTSIDE SLOPE

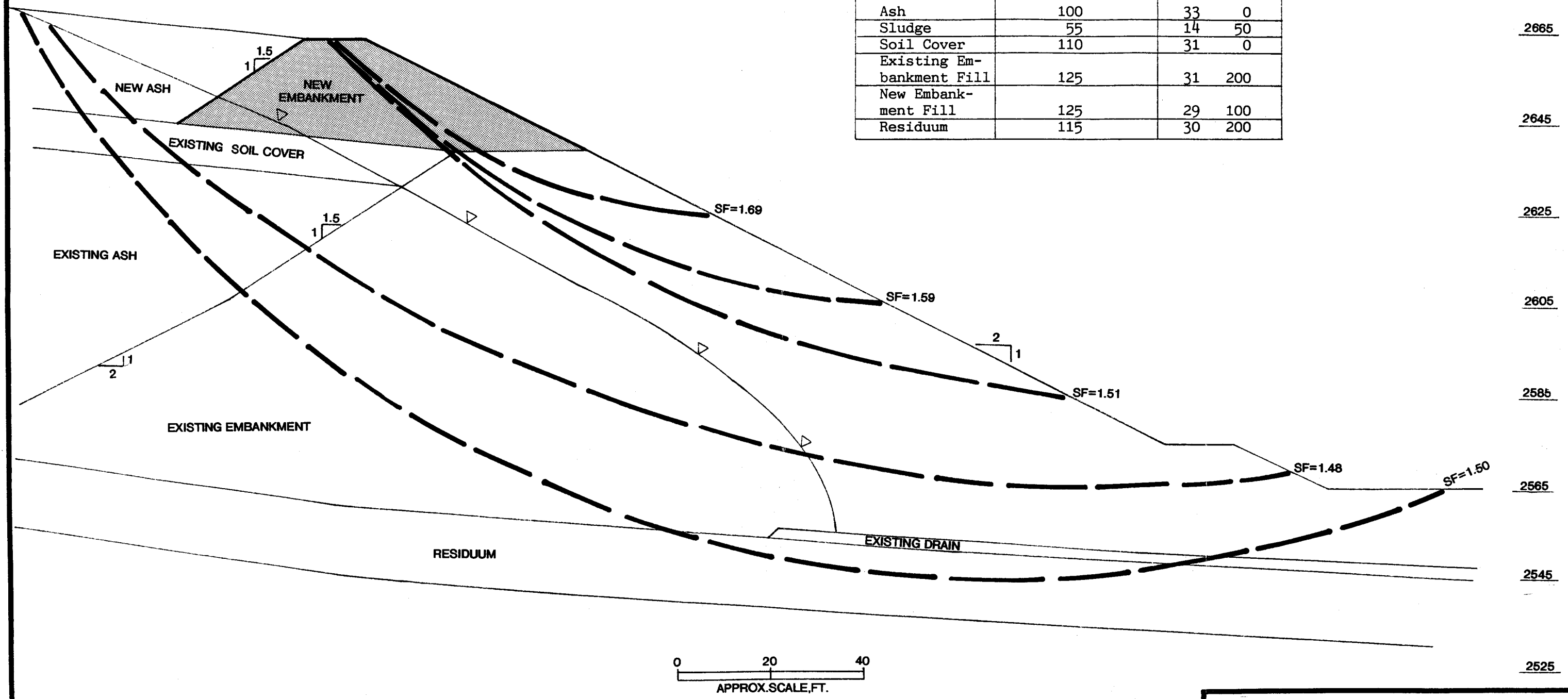
LAW ENGINEERING
CHARLOTTE, NORTH CAROLINA

SLOPE STABILITY ANALYSES
LANDFILL DIKE VERTICAL EXTENSION
CHAMPION INTERNATIONAL-LANDFILL 6 B,C
CANTON, NORTH CAROLINA

JOB NO. 222-04344-01 | FIGURE 3

DESIGN STRENGTH PARAMETERS

Material	Unit Weight, pcf	Long Term ϕ'° C', psf
Ash	100	33 0
Sludge	55	14 50
Soil Cover	110	31 0
Existing Embankment Fill	125	31 200
New Embankment Fill	125	29 100
Residuum	115	30 200



SECTION B-B'
LONG TERM CONDITIONS
OUTSIDE SLOPE

LAW ENGINEERING
CHARLOTTE, NORTH CAROLINA

SLOPE STABILITY ANALYSES
LANDFILL DIKE VERTICAL EXTENSION
CHAMPION INTERNATIONAL-LANDFILL 6 B,C
CANTON, NORTH CAROLINA

JOB NO. 222-04344-01 | FIGURE 4

CORRELATION OF PENETRATION RESISTANCE WITH RELATIVE DENSITY AND CONSISTENCY

	NO. OF BLOWS, N	RELATIVE DENSITY
SANDS:	0-4	Very Loose
	5-10	Loose
	11-20	Firm
	21-30	Very Firm
	31-50	Dense
	OVER 50	Very Dense

	CONSISTENCY	
SILTS & CLAYS:	0-2	Very Soft
	3-4	Soft
	5-8	Firm
	9-15	Stiff
	16-30	Very stiff
	31-50	Hard
	OVER 50	Very Hard

PARTICAL SIZE IDENTIFICATION

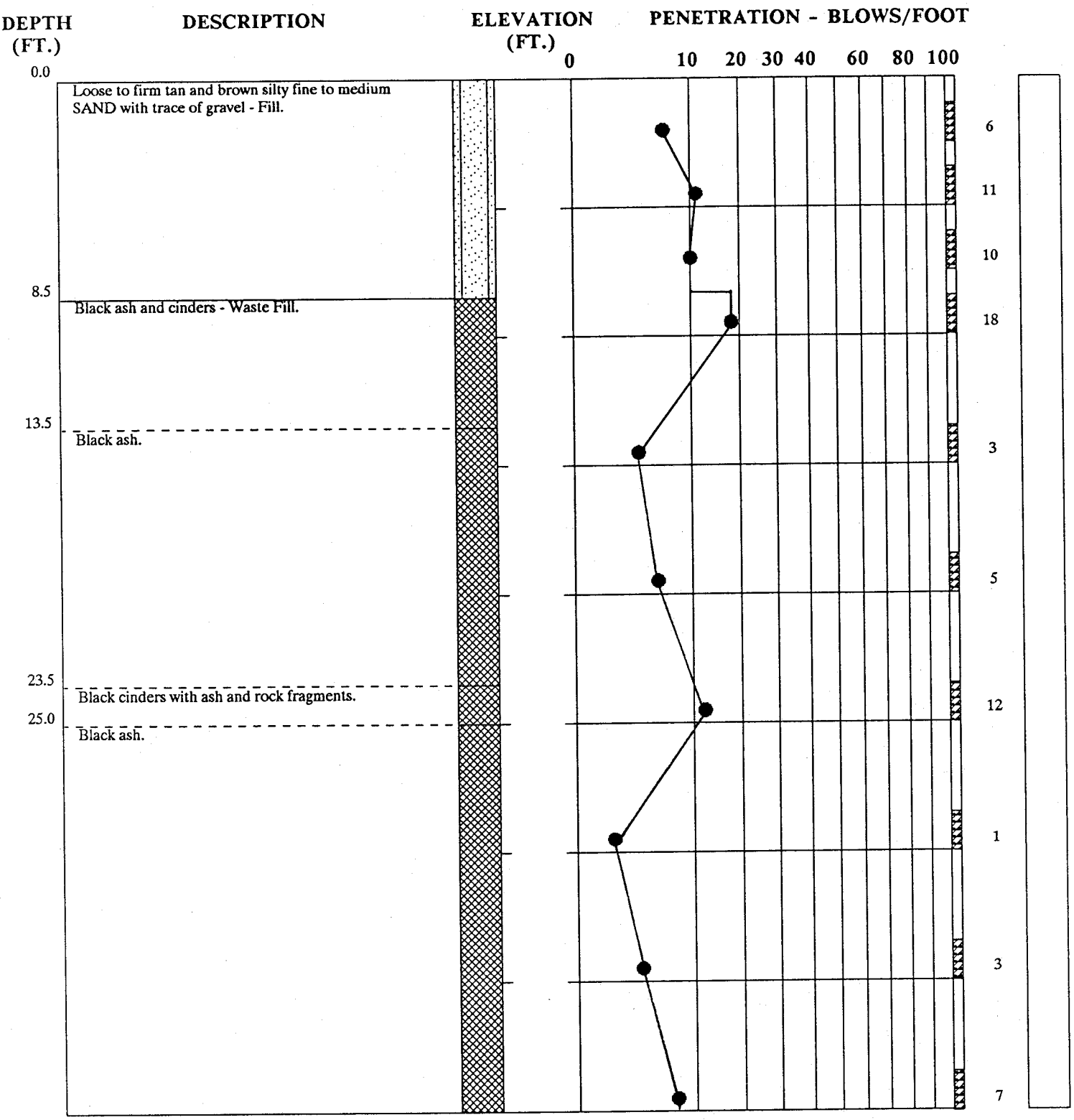
BOULDERS:		Greater than 300 mm
COBBLES:		75 mm to 300 mm
GRAVEL:	Coarse -	19.0 mm to 75 mm
	Fine -	4.75 mm to 19.0 mm
SANDS:	Coarse -	2.00 mm to 4.75 mm
	Medium -	0.425 mm to 2.00 mm
	Fine -	0.075 mm to 0.425 mm
SILTS & CLAYS:		Less than 0.075 mm

KEY TO DRILLING SYMBOLS

- Undisturbed Sample
- Split Spoon Sample
- Water Table 24 HR.
- Water Table at Time of Drilling
- Pressuremeter Test
- Loss of Drilling Water

KEY TO SOIL CLASSIFICATIONS

- ASPHALT
- CL - Low plasticity inorganic clays
- CH - High plasticity inorganic clays
- ML - Low plasticity inorganic silts and very fine sands
- MH - High plasticity inorganic silts
- SP - Poorly graded sands
- SW - Well graded sands
- GP - Poorly graded gravels
- PARTIALLY WEATHERED ROCK - A transitional material between soil and rock which retains the relict structure of the parent rock.
- CONCRETE
- GW - Well graded gravels
- OL - Low plasticity organic silts and clays
- OH - High plasticity organic silts and clays
- SM - Silty sands
- GM - Silty gravels
- SC - Clayey sands
- GC - Clayey gravels
- SP-SM - Typical Dual Classification



REMARKS:

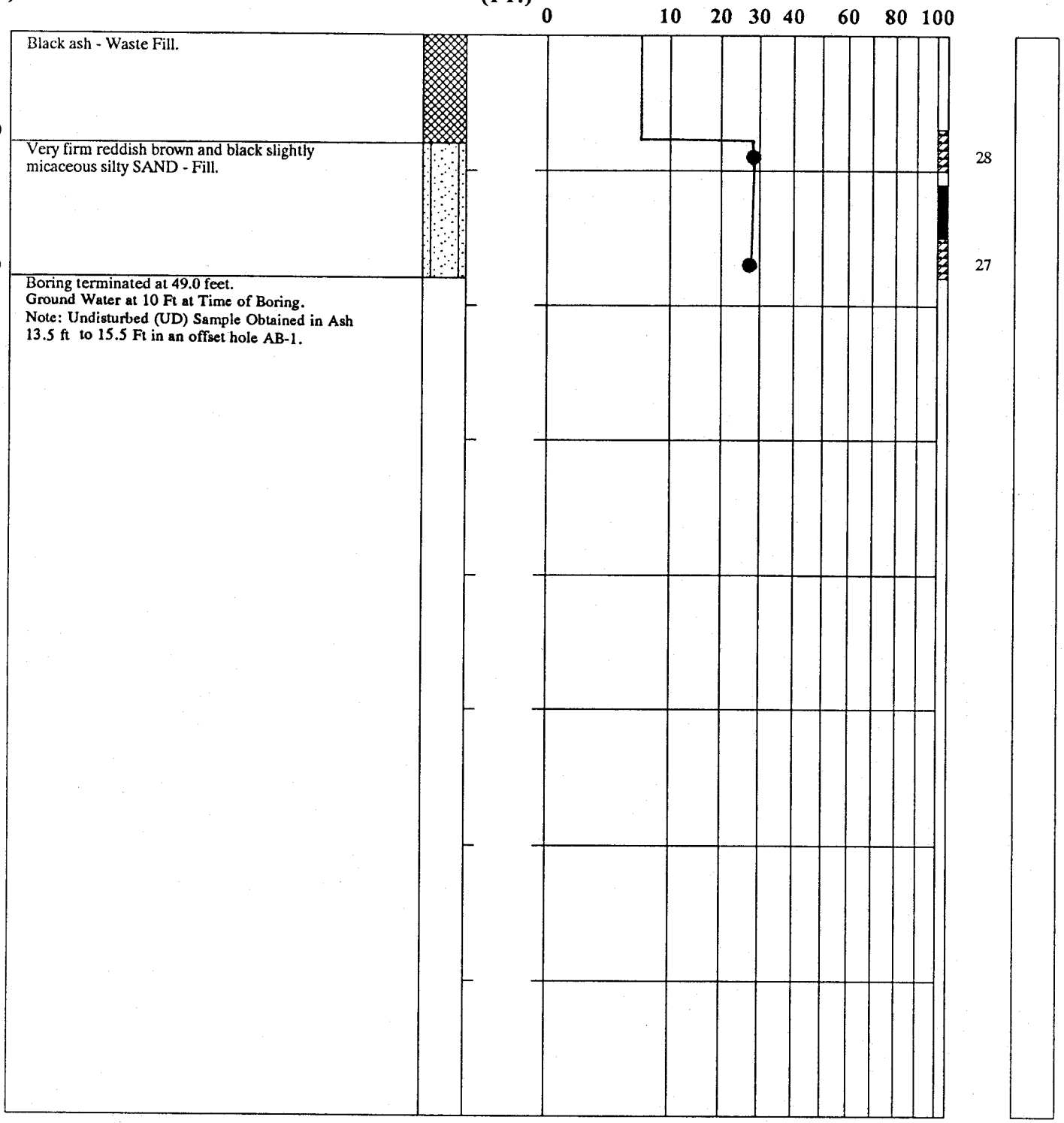
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B- 1
DATE DRILLED	October 29, 1991
PROJECT NUMBER	2420434401
PROJECT	CHAMPION LANDFILL
PAGE 1 OF 2	

LAW ENGINEERING

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION - BLOWS/FOOT
	Black ash - Waste Fill.		
44.0	Very firm reddish brown and black slightly micaceous silty SAND - Fill.		
49.0	Boring terminated at 49.0 feet. Ground Water at 10 Ft at Time of Boring. Note: Undisturbed (UD) Sample Obtained in Ash 13.5 ft to 15.5 Ft in an offset hole AB-1.		



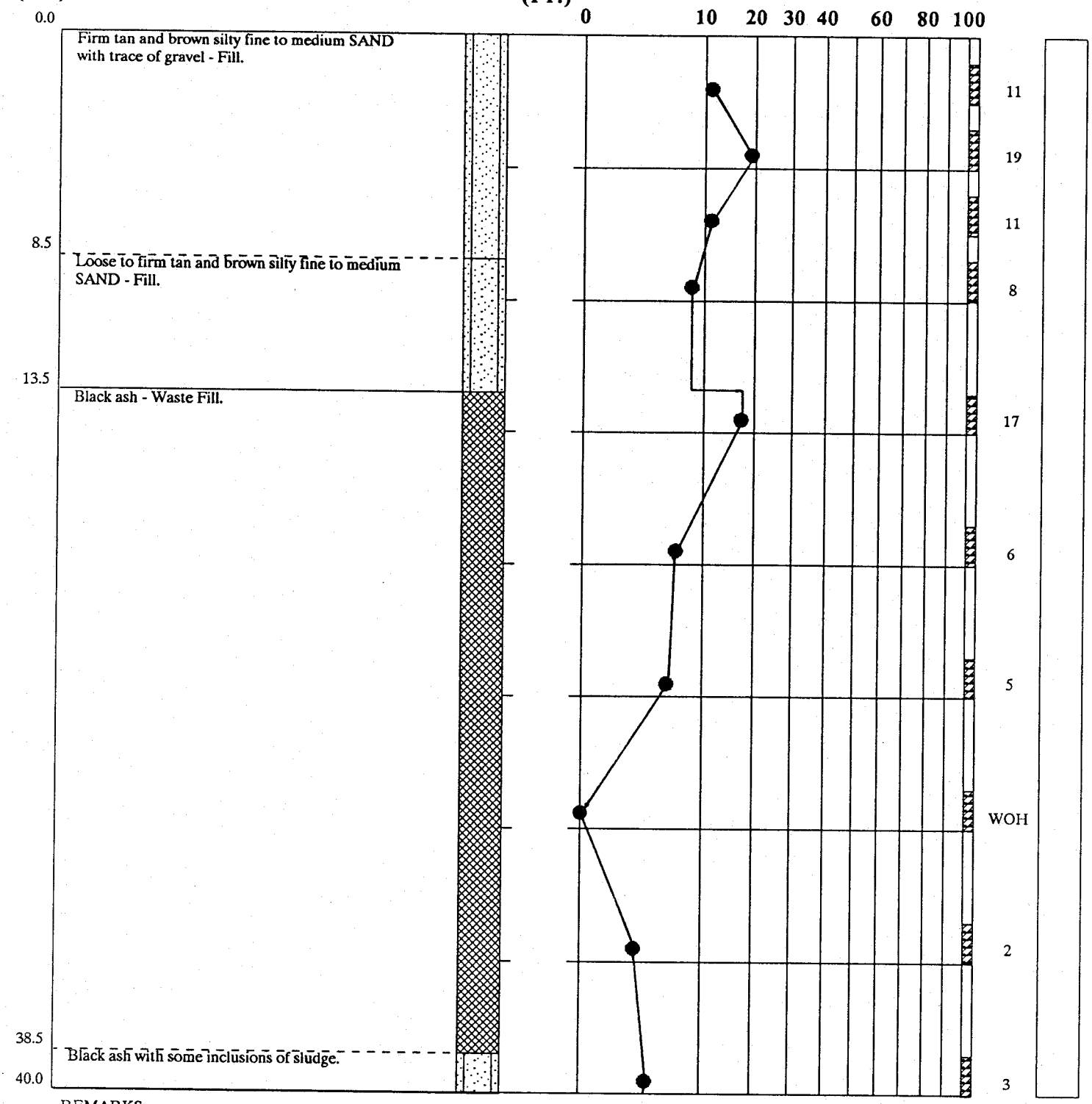
REMARKS:

TEST BORING RECORD

BORING NUMBER	B- 1
DATE DRILLED	October 29, 1991
PROJECT NUMBER	2420434401
PROJECT	CHAMPION LANDFILL
PAGE 2 OF 2	

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

LAW ENGINEERING



REMARKS:

WOH = Weight of Hammer

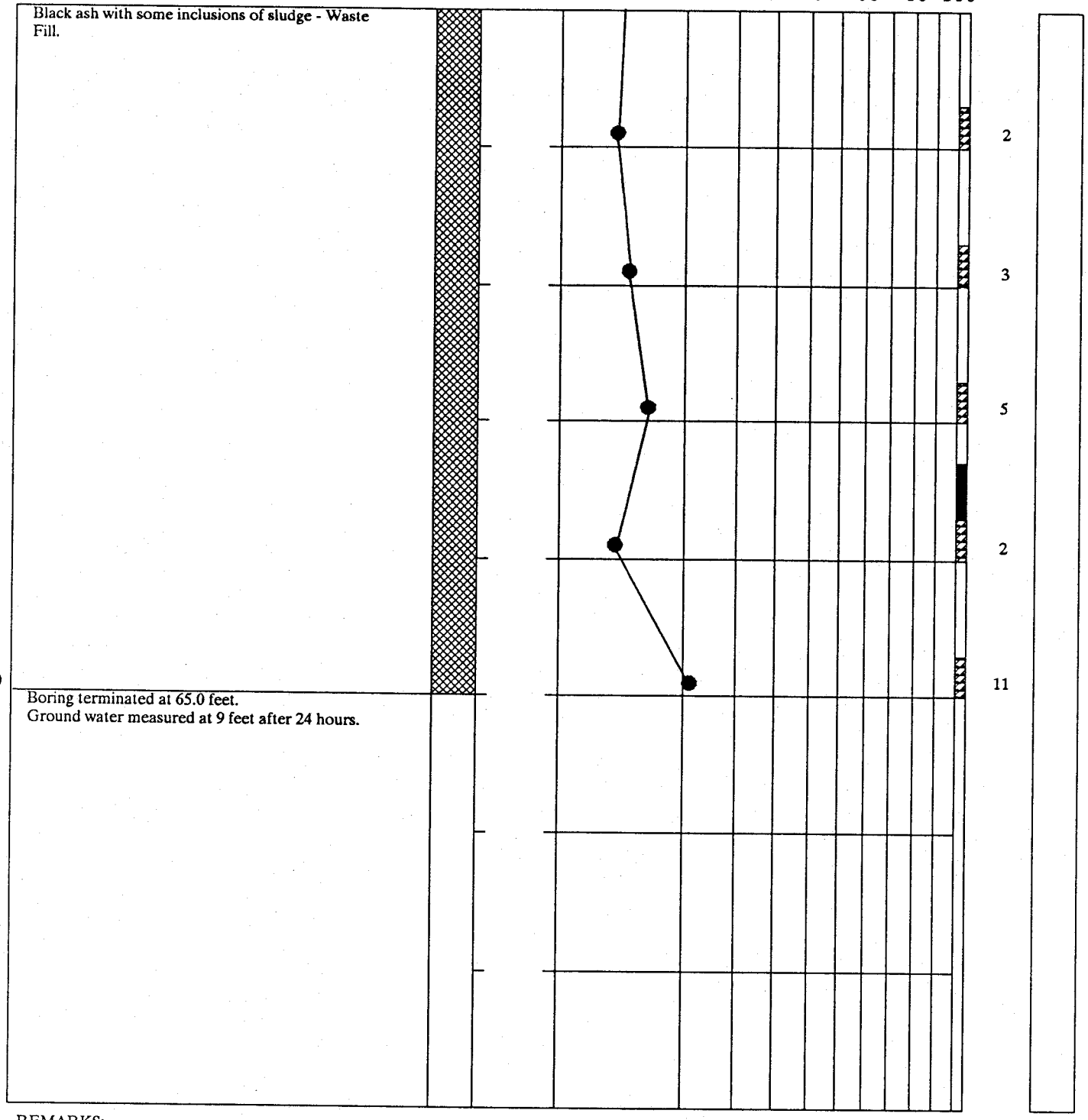
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B- 2
DATE DRILLED	October 29, 1991
PROJECT NUMBER	2420434401
PROJECT	CHAMPION LANDFILL
PAGE 1 OF 2	

LAW ENGINEERING

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION - BLOWS/FOOT 0 10 20 30 40 60 80 100
	Black ash with some inclusions of sludge - Waste Fill.		2 3 5 2
65.0	Boring terminated at 65.0 feet. Ground water measured at 9 feet after 24 hours.		11



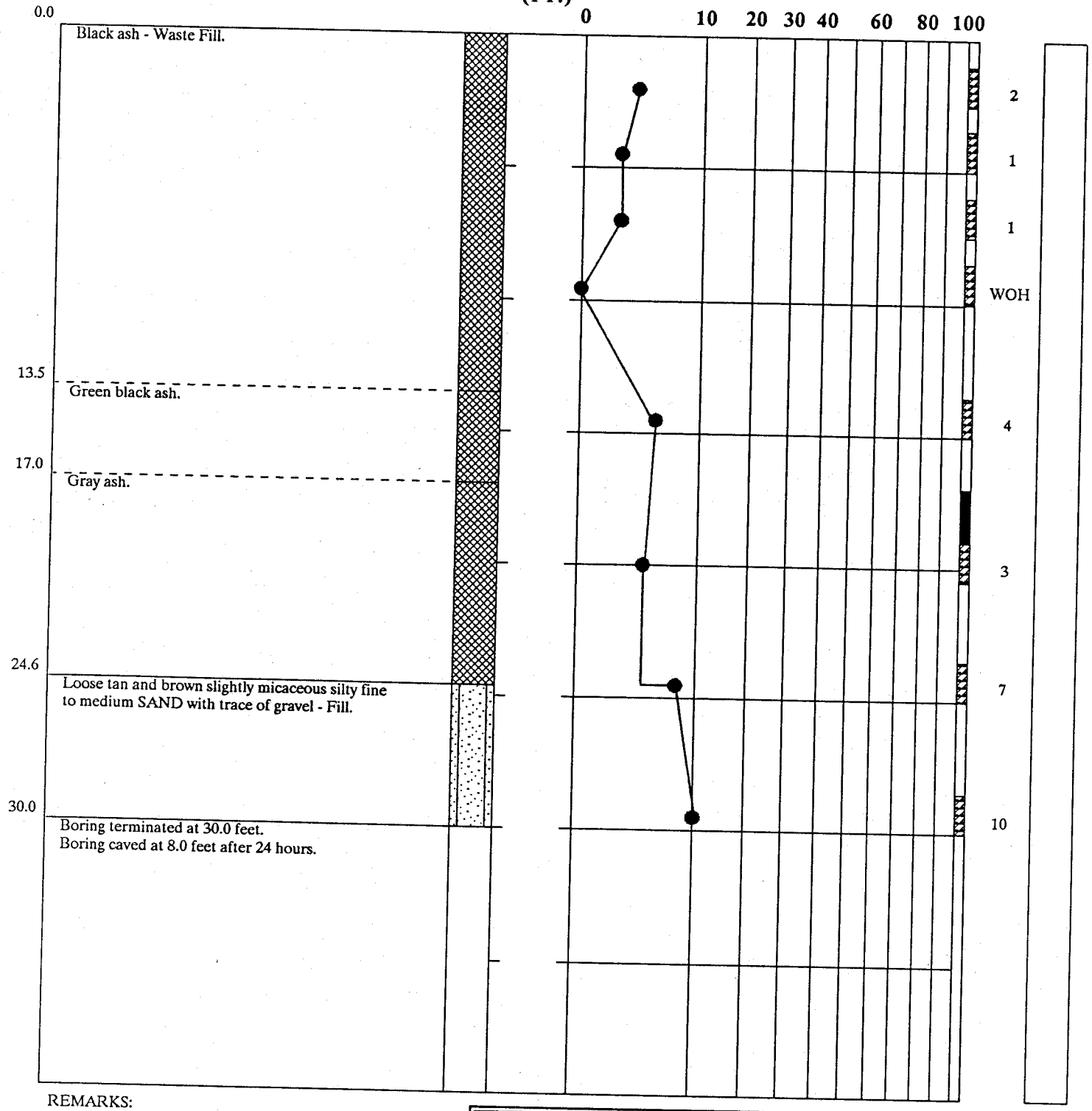
REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B- 2
DATE DRILLED	October 29, 1991
PROJECT NUMBER	2420434401
PROJECT	CHAMPION LANDFILL
PAGE 2 OF 2	

LAW ENGINEERING



REMARKS:

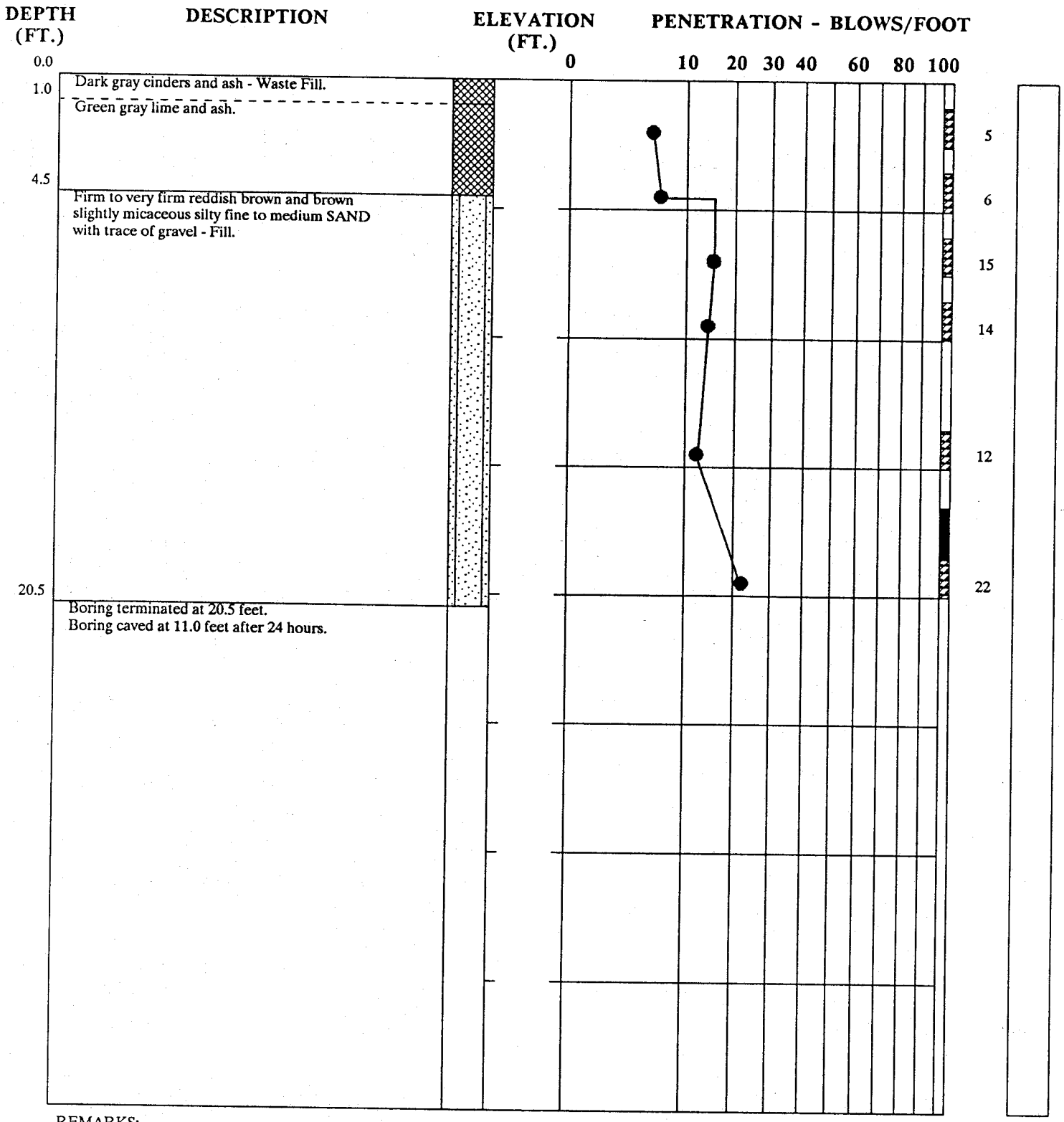
WOH = Weight of Hammer

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B- 3
DATE DRILLED	October 30, 1991
PROJECT NUMBER	2420434401
PROJECT	CHAMPION LANDFILL
PAGE 1 OF 1	

LAW ENGINEERING



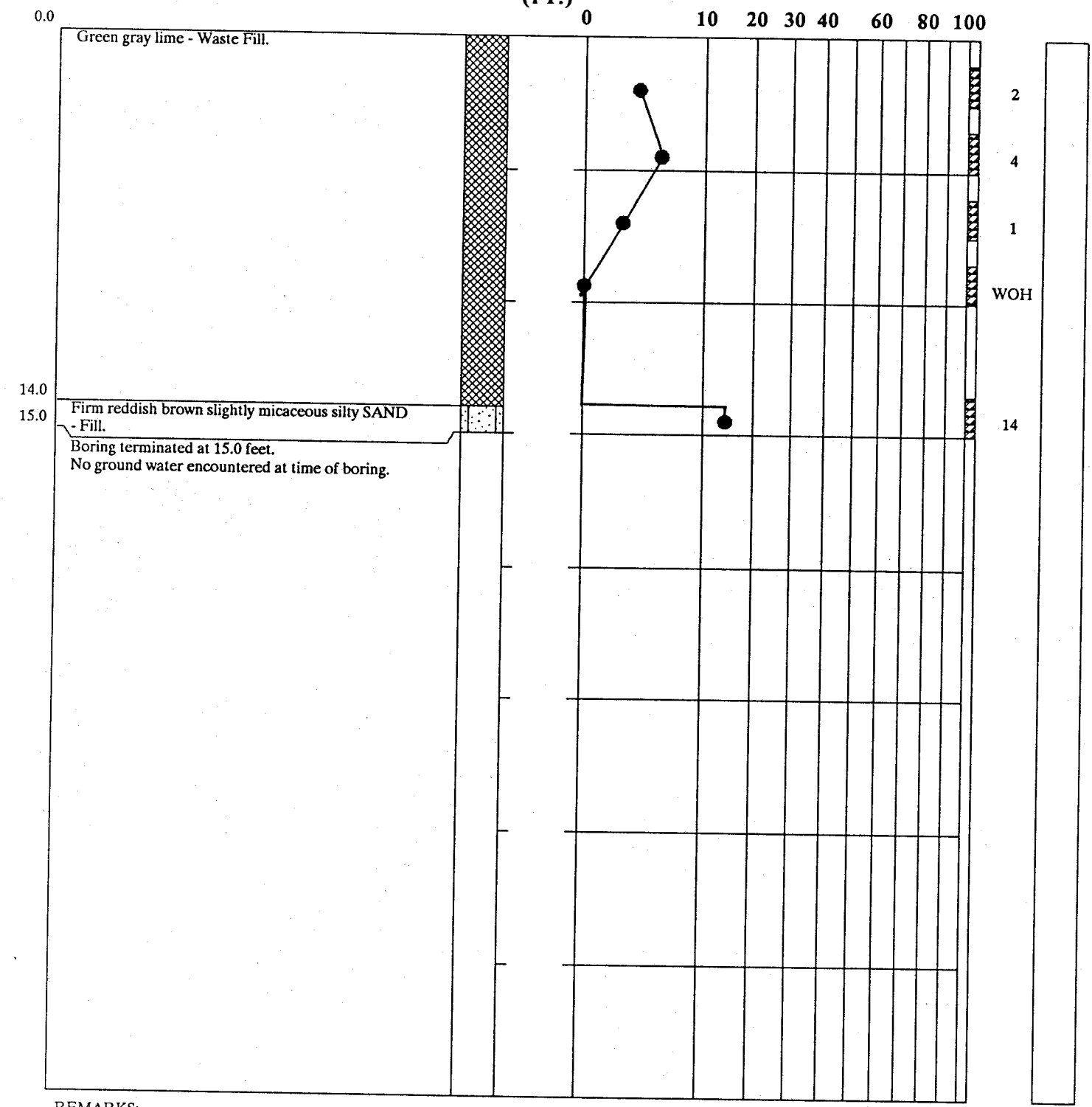
REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B- 4
DATE DRILLED	October 30, 1991
PROJECT NUMBER	2420434401
PROJECT	CHAMPION LANDFILL
PAGE 1 OF 1	

LAW ENGINEERING



REMARKS:

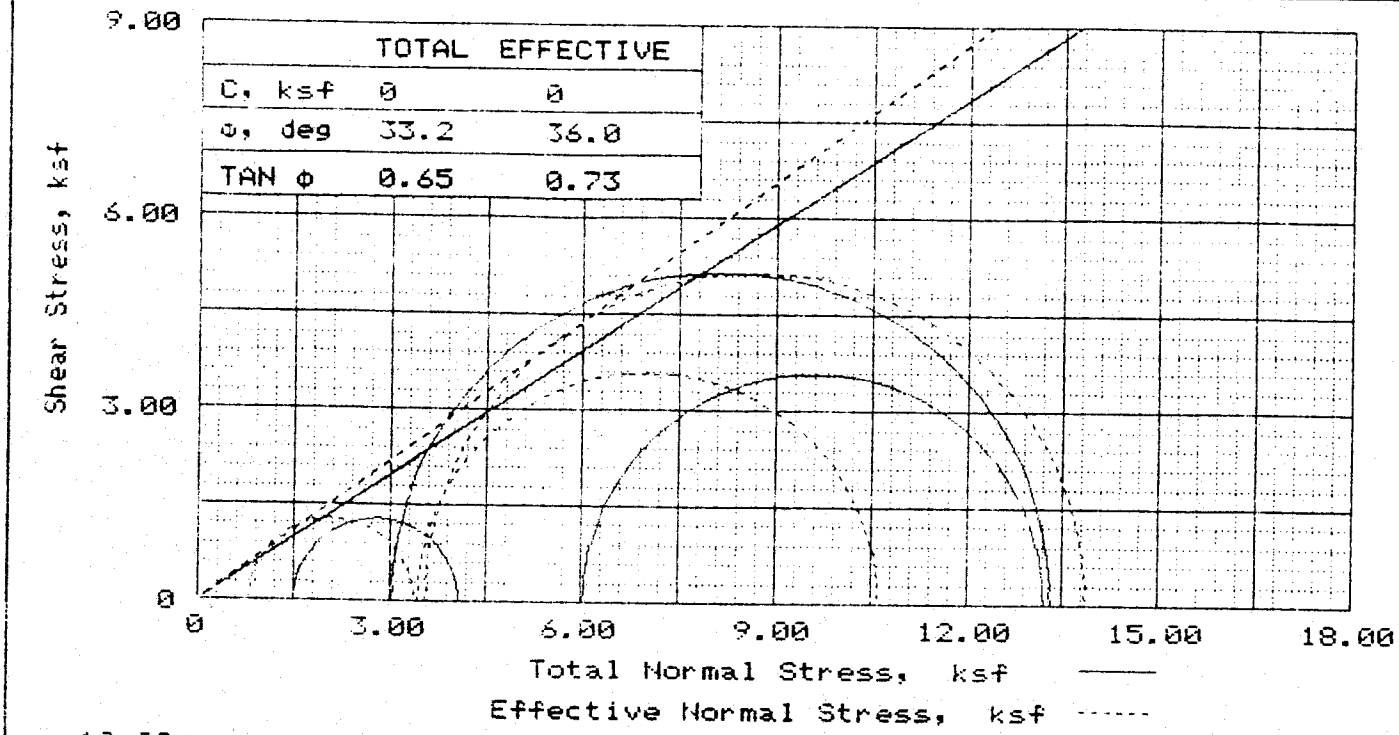
WOH - Weight of hammer.

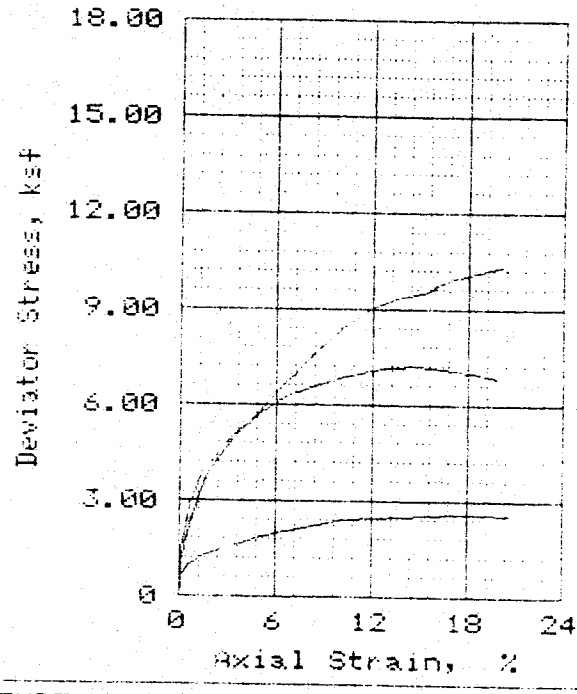
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B- 5
DATE DRILLED	October 28, 1991
PROJECT NUMBER	2420434401
PROJECT	CHAMPION LANDFILL
PAGE 1 OF 1	

LAW ENGINEERING





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	29.8	46.3	86.2
	DRY DENSITY, pcf	90.7	67.5	46.2
	SATURATION, %	95.4	84.2	88.3
	VOID RATIO	0.831	1.461	2.597
	DIAMETER, in	2.86	2.87	2.83
	HEIGHT, in	5.80	5.95	6.05
AT TEST	WATER CONTENT, %	29.0	52.9	86.7
	DRY DENSITY, pcf	93.8	68.9	50.2
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.771	1.408	2.307
	DIAMETER, in	2.81	2.84	2.71
	HEIGHT, in	5.80	5.95	6.05
BACK PRESSURE, ksf		4.32	5.76	4.32
CELL PRESSURE, ksf		5.83	8.78	10.37
FAILURE STRESS, ksf		2.57	10.32	7.18
PORE PRESSURE, ksf		5.03	5.23	6.93
STRAIN RATE, %/min.		0.170	0.170	0.170
ULTIMATE STRESS, ksf				
PORE PRESSURE, ksf				
$\bar{\sigma}_1$ FAILURE, ksf		3.38	13.87	10.62
$\bar{\sigma}_3$ FAILURE, ksf		0.81	3.56	3.44

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE: UD
DESCRIPTION:

LL= PL= PI=
SPECIFIC GRAVITY= 2.66
REMARKS:

FIG. NO.

CLIENT:

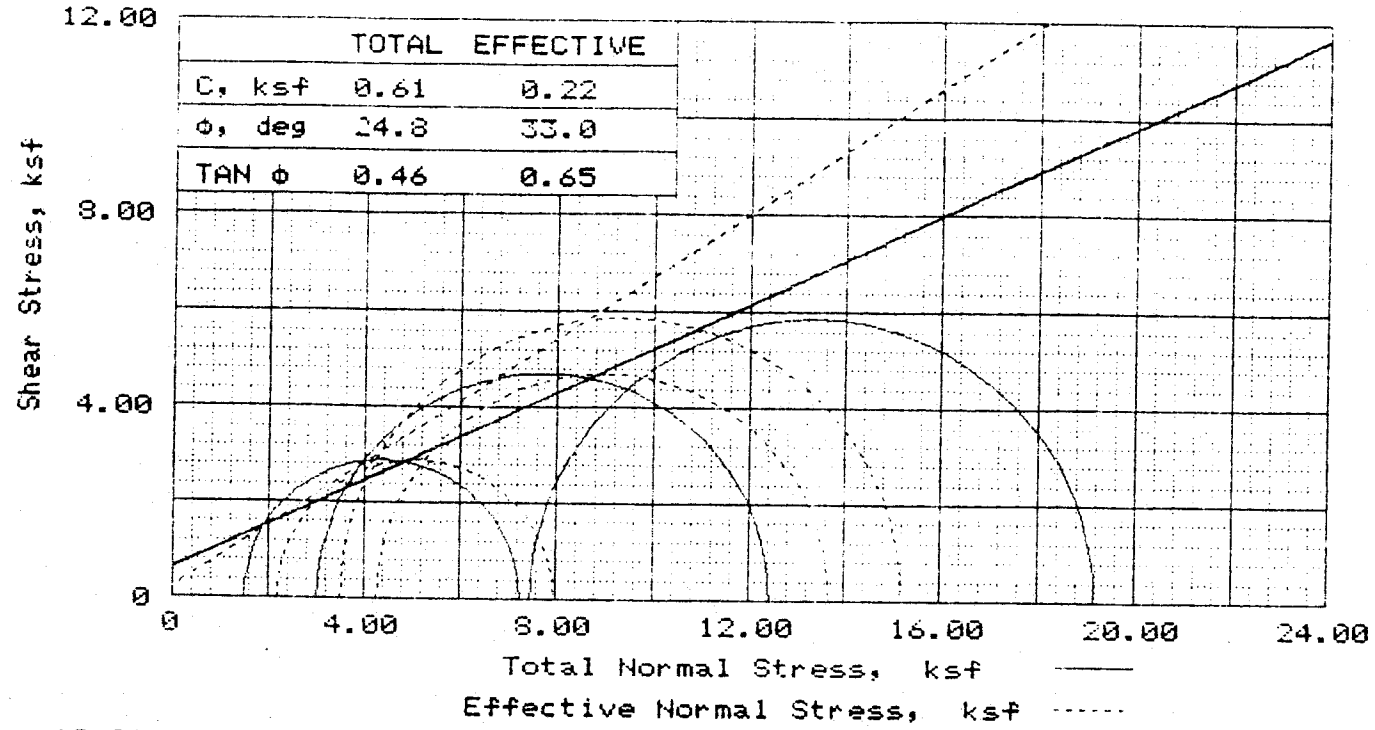
PROJECT: CHAMPION LANDFILL

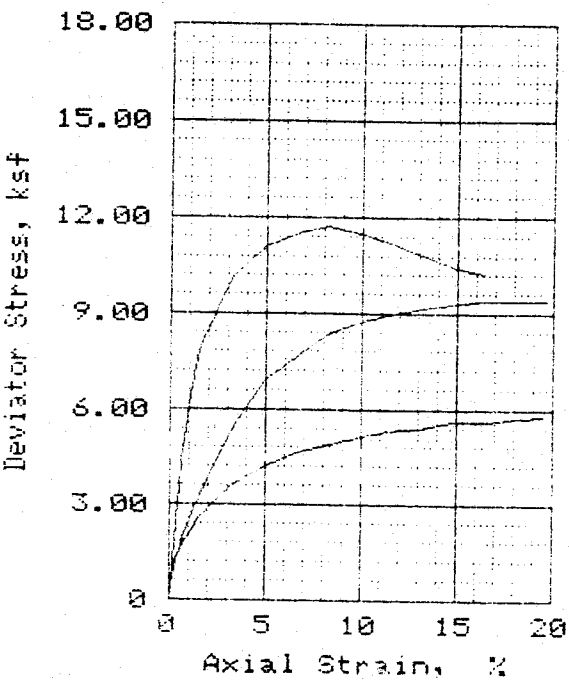
SAMPLE LOCATION: AB-1 / 13.5' TO 15.5'
(Offset Next to B-1)

PROJ. NO.: 2420434901 DATE: 11/19/91

TRIAXIAL COMPRESSION TEST

LAW ENGINEERING





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	15.7	17.8	15.8
	DRY DENSITY, pcf	112.5	110.9	101.0
	SATURATION, %	76.5	83.7	58.7
	VOID RATIO	0.588	0.610	0.768
	DIAMETER, in	2.87	2.87	2.87
	HEIGHT, in	6.15	6.10	6.07
AT TEST	WATER CONTENT, %	19.5	20.0	27.0
	DRY DENSITY, pcf	114.6	113.7	100.7
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.557	0.571	0.773
	DIAMETER, in	2.84	2.84	2.87
	HEIGHT, in	6.15	6.10	6.07
BACK PRESSURE, ksf		5.76	4.32	4.32
CELL PRESSURE, ksf		7.27	7.34	11.81
FAILURE STRESS, ksf		5.76	9.42	11.71
PORE PRESSURE, ksf		5.07	3.07	8.29
STRAIN RATE, %/min.		0.170	0.170	0.170
ULTIMATE STRESS, ksf				
PORE PRESSURE, ksf				
$\bar{\sigma}_1$ FAILURE, ksf		7.96	13.70	15.22
$\bar{\sigma}_3$ FAILURE, ksf		2.2	4.28	3.51

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE: UD
DESCRIPTION:

LL= PL= PI=
SPECIFIC GRAVITY= 2.86
REMARKS:

FIG. NO.

CLIENT:

PROJECT: CHAMPION LANDFILL

SAMPLE LOCATION: B-4 / 17' TO 19'

PROJ. NO.: 2420434901 DATE: 11/19/91

TRIAXIAL COMPRESSION TEST

LAW ENGINEERING

ATTACHMENT B

DESIGN DRAWINGS FOR LANDFILL

DIKE VERTICAL EXTENSION

ATTACHMENT C

TECHNICAL SPECIFICATIONS FOR

CONSTRUCTION OF LANDFILL DIKE

VERTICAL EXTENSION

TECHNICAL SPECIFICATIONS

Reference Specifications

1) Applicable provisions of the specifications contained in the "Bid Documents and Specifications for Preparation of Area C Landfill No. 6" dated May 1986 will generally apply to this work. The Engineer will determine applicability.

2) In case of conflict between the Reference Specifications and the following provisions, the following provisions will govern.

Earthwork

1) The area of the landfill dike vertical extension shall be stripped to a depth necessary to remove topsoil and other soils containing more than 5 percent by weight fibrous organic matter, rubbish, vegetable matter, roots and all other perishable or objectionable matter. The materials derived from these operations shall be removed from the site or placed in an approved spoil area at the Engineer's direction. Crushed stone surfacing on crest of existing dike shall be scarified to a depth of at least 4 inches prior to placing new fill. See Section 4 of Bid Documents and Specifications for Preparation of Area C Landfill No. 6, May 1986.

2) The dike area shall be graded to the elevations, lines, grades and cross sections indicated on the Drawings or any revisions thereto. Excess excavated material, if any, shall be spoiled or stockpiled in an approved area or removed from the site at the Engineer's direction.

3) Fill materials shall be clean soils containing less than 5 percent by weight fibrous organic material, plasticity index less than 15 and of proper moisture content for compaction (within $\pm$3 percent of the laboratory optimum moisture content). On-site excavated materials meeting these requirements may be used in fill. Fill shall be constructed in thin horizontal layers with each layer uniformly compacted to densities not less than 95 percent of the standard Proctor maximum dry density (ASTM D 698). See Section 7 of Bid Documents and Specifications for Preparation of Area C Landfill No. 6, May 1986.

Drainage and Erosion Control

1) Proper drainage of the construction area shall be maintained at all times during construction. It will be the Contractor's responsibility to do all that is required to protect against erosion damage of exposed soil areas and to provide adequate temporary erosion control. The Contractor shall be responsible to complying with all State and County regulations concerning erosion and sediment control.

2) A permanent stand of erosion resistant perennial grass shall be established on all new fill areas and surfaces disturbed by the construction operations and not covered by any stone or other permanent surfacing. See Section 15 of Bid Documents and Specifications for Preparation of Area C Landfill No. 6, May 1986.

Stone and Filter Materials

1) Crushed stone for the crest shall meet the criteria of North Carolina Standard Size No. ABC (Aggregate Base Course). Contractor shall spread and shape the material to the lines and grades as shown on the Drawings. The material shall be watered, as needed, and compacted to provide a firm and durable base. See Section 12 of Bid Documents and Specifications for Preparation of Area C Landfill No. 6, May 1986.

2) Washed stone drainage materials called for on the Drawings shall consist of durable angular broken rock of suitable quality to insure permanence.

3) Filter fabric shall be as called for on the Drawings and shall be installed in accordance with the manufacturer's recommendations.

Leachate Collection Strip Drains

1) The leachate collection strip drains shall consist of a layer of washed stone and interbedded perforated or slotted piping as shown on the Drawings. See Paragraph 8.2.1 of Bid Documents and Specifications for Preparation of Area C Landfill No. 6, May 1986.

2) The interbedded pipe shall consist of 6-inch diameter perforated Schedule 40 PVC pipe sections or slotted, corrugated HDPE pipe sections having strength against crushing equivalent to the Schedule 40 PVC.

Quality Assurance/Quality Control

1) Critical phases of the construction will be monitored by an engineering technician working under the direct supervision of the design engineer.

2) The engineering technician will observe the earthwork operations and perform field density tests to check conformance with the Drawings and Specifications.

3) Standard Proctor compaction tests (ASTM D 698) will be performed on each significantly different soil type used in construction of the new embankment.

4) Field density tests will be performed at a minimum frequency of one for every 500 cubic yards of in-place embankment soil or one for every 22,000 square feet per lift, but not less than one for each day that fill is placed. The field density tests will be performed by the drive tube method (ASTM D 2937) or the sand cone method (ASTM D 1556). Moisture contents on the density samples will be determined by oven-drying (ASTM D 2216) methods.

5) Field observations and all tests will be documented.

6) Soil test borings will be made in Area C after the lime waste berm is in place but before new embankment fill is placed. Purpose of borings will be to verify that large pockets of sludge are not trapped beneath the lime waste berm in the zone affected by the new embankment. Borings will be spaced approximately 200 feet apart along inside toe of proposed soil dike vertical extension. Standard penetration tests (ASTM D 1586) will be performed at 5 foot depth intervals to check consistency of the lime waste.